with the invention, the dimension and thickness of the various elements being greatly increased to facilitate an understanding of the structure.

The by-pass device **10** is comprised of a ceramic monolith including one or more dielectric layers **11**, the opposite surfaces of which have formed thereon U-shaped upper and lower electrodes **12** and **13**. Electrode **12** includes a base portion **14** having legs **15** and **16** projecting from the opposite ends. Electrode **13** includes a base portion **14*a*** from the opposite ends of which project leg portions **15*a*** and **16*a***.

As best seen in FIG. **2** electrodes **12** and **13** are disposed respectively above and below dielectric **11** in such manner that the respective base portions **14–14*a*** are exposed at opposite edges of the monolith. As will be appreciated from FIG. **2** wherein a single unit comprised of upper and lower electrodes and an intervening dielectric layer are shown in solid lines, any number of layers may be formed in the stacked monolith to achieve the desired values of capacitance and inductance.

Terminations **17–18** are formed at the end margins of the monolith, the termination **17** being electrically coupled to the base portions **14*a*** of the electrodes **13** and termination **18** being electrically coupled to the base portion or portions of electrodes **12** of the monolith.

As is evident from FIG. **2**, due to the smaller width and lengths L2 of legs **15** and **15*a*** the registering or overlapping area **19** defined by the legs **15–15*a*** will be less than the overlapping area **20** defined by longer and wider legs **16–16*a*** whose length is represented by the notation L1.

The capacitance defined in the area **19** will be less than the capacitance defined in the area **20**, since capacitance is directly proportional to the areas of overlap. It will thus be appreciated that the desired capacitive differential between capacitor C1 defined by overlapping areas **19** from the larger capacitance C2 defined by overlapping areas **20** can be achieved by varying the width of the respective overlapping leg components or by varying the length of the overlapping components or by both expedients.

Particularly desirable is adjusting capacitance in accordance with the length of the overlapping legs, since the inductance provided is a function of the entire length of the conductive path and thus by utilizing legs of different lengths there is inherently provided a larger inductance where the leg lengths are longer whereby the inductance value is automatically greater to interact with the larger capacitance.

Methodology

The manner of fabrication of the by-pass device is identical to the conventional methods of fabricating ceramic capacitors. Since this methodology is well known to those skilled in the art it will be merely briefly described below.

The dielectric components are formed by casting a thin layer of a slurry of finely divided dielectric forming material such as barium titanate suspended in a liquid matrix including binder. The "green" ceramic is screen printed with electrode forming ink in the desired U-shaped patterns. Typically, the ink will include a noble metal, such as palladium. Patterned green ceramics are superposed to provide the desired number of layers, the patterns of adjacent layers being coordinated to achieve the desired overlapped condition. Individual units are diced from the superposed layers in such manner as to expose base portions **14–14*a*** at opposite ends of the pre-fired chips. The diced units are thereafter subjected to binder burn-off at a first temperature and thereafter sintered at a higher temperature to define the monolith.

Terminations **17–18** are applied to the respective exposed base portions **14** at one end and **14*a*** at the other end. Terminations may be formed in any of a number of known manners including vapor deposition to provide electrical and mechanical bond to the exposed electrode bases at opposite ends of the monolith followed by application of one or more metallic layers over the sputtered layer to enable soldering to the motherboard. The terminations may extend beyond the end margins where surface mounting is desired. Alternative termination methods include applications of carbon followed by an outer silver layer with or without intervening metallic layers between carbon and silver.

EXAMPLE

Without limitation, and in compliance with the "best mode" requirements of the patent laws of the United States, a specific example of an assembly in accordance with the invention is provided below.

A monolith is formed utilizing 16 active layers of a barium titanate ceramic approximately 20 micron thickness. In such example, seventeen active electrodes are employed. In the example provided, the widths W1 of the legs **15** and **15*a*** and the widths W3 of the legs **16** and **16*a*** are identical and comprise 0.007 inches. The length of the branch W2 between legs W1 and W3 is also 0.007 inches. The length L1 of legs **16,16*a*** is 0.050 inches with the length of legs L2 being 0.035 inches. The electrodes are stacked such that the overlap or registering area **20** of legs **16,16*a*** is substantially three times the overlap area **19** of legs **15,15*a***.

A batch of the described components was tested, the capacitance C1 defined by overlap area **20** being approximately 47 picofarad and in the capacitance C2 defined by area **19** being approximately 15 picofarad. Inductance La is approximately 800 picohenry, inductance Lb was measured at approximately 600 picohenry.

Preferably, the two capacitive values should be at least a half a decade apart. In the illustrated example, the resistances R1 and R2 were each approximately 200 Ω. Obviously, by tailoring the overlap area a wide diversity of capacitor values may be achieved. Similarly, by modifying the length and the width of the electrode legs and base, the desired inductances may be tailored to fit specific situations. The values of the illustrated example have been found highly efficient as by-pass devices for dual mode cellular phones operating on respective analog and digital frequencies of 900 MHz and 1.9 GHz. Of particular advantage is the predictable nature of the inductance as contrasted with the large variations resulting from the utilization of separate capacitors with the attendant variations in path lengths of the leads between the capacitors.

As will be apparent to those skilled in the art who have been familiarized with the instant disclosure, numerous variations in details of construction may be derived without departing from the spirit of the invention. Accordingly, the invention is to be broadly construed within the scope of the appended claims.

We claim:

1. An integrated ceramic dual frequency by-pass device including a parallel connected pair of ceramic capacitors of disparate values, each capacitor including a series connected inductance comprising at least one planar dielectric layer, a first electrode and a second electrode disposed on respective opposite surfaces of said dielectric layer, said first electrode and said second electrode each being of generally U-shape and including a base portion and a pair of leg portions extending from said base portion, said base portion of said

first electrode being disposed at an opposite end of said dielectric layer from said base portion of said second electrode, said leg portions of each of said first electrode and said second electrode extending toward said base portion of the other, each of said leg portions of said first electrode being disposed in registry with an area of respective said leg portions of said second electrode, the areas of registration being of different values whereby a capacitance defined between a first registering pair of said leg portions differs from a capacitance defined between a second registering pair of said leg portions.

2. A device in accordance with claim **1** and including first and second terminations at opposite ends of said dielectric layer, each of said first and second terminations being electrically connected to a respective said base portion of said first electrode and said second electrode.

3. A device in accordance with claim **2** wherein said lea portions and said base portion of said first and second electrodes defines a respective inductance of predetermined value.

4. A device in accordance with claim **1** wherein a first of said leg portions has a length greater than a second of said leg portions.

5. A device in accordance with claim **1** wherein a first of said legs portions has a width greater than a second of said leg portions.

6. A device in accordance with claim **1** wherein a first of said leg portions has a length and width greater than a second of said leg portions.

7. A device in accordance with claim **1** comprising a multilayer stacked configuration having a plurality of dielectric layers each having a respective first electrode and a second electrode on opposite surfaces thereof, each said first electrode being connected in parallel with each other and each said second electrode being connected in parallel with each other.

8. An integrated ceramic by-pass device providing a pair of parallel-connected ceramic capacitors of disparate capacitor values in a single component package, said device comprising:

- a device body having a first polarity termination and a second polarity termination located on respective opposite ends thereof;
- said device body comprising a plurality of dielectric layers, each dielectric layer having a first pair of leg portions extending from said first termination on a top surface thereof and a second pair of leg portions extending from said second termination on a bottom surface of said dielectric layer;
- one of said first leg portions overlapping a corresponding one of said second leg portions to define a first predetermined capacitance value; and
- another of said first leg portions overlapping a corresponding other of said second leg portions to define a second predetermined capacitance value, whereby first and second parallel capacitors of said disparate capacitance values are provided.

9. An integrated ceramic by-pass device as set forth in claim **8**, wherein said first pair of leg portions are interconnected by a first base portion and said second pair of leg portions are interconnected by a second base portion.

10. An integrated ceramic by-pass device as set forth in claim **8**, wherein:

- said one of said first leg portions has a length greater than said another of said first leg portions; and
- said corresponding one of said second leg portions has a length greater than said corresponding other of said second leg portions.

11. An integrated ceramic by-pass device as set forth in claim **8**, wherein:

- said one of said first leg portions has a width greater than said another of said first leg portions; and
- said corresponding one of said second leg portions has a width greater than said corresponding other of said second leg portions.

12. An integrated ceramic by-pass device comprising:

- a device body having a first polarity termination and a second polarity termination located on respective opposite ends thereof;
- said device body comprising a plurality of dielectric layers, each dielectric layer having a first pair of leg portions extending from said first termination on a top surface thereof and a second pair of leg portions extending from said second termination on a bottom surface of said dielectric layer;
- one of said first leg portions overlapping a corresponding one of said second leg portions to define a first predetermined capacitance value;
- another of said first leg portions overlapping a corresponding other of said second leg portions to define a second predetermined capacitance value; and
- wherein a first area of overlap defined by said one of said first pair of leg portions and said corresponding one of said second pair of leg portions is substantially three times a second area of overlap defined by said another of said first pair of leg portions and said corresponding other of said second pair of leg portions.

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{See previously filed preliminary amendment for new claims 13-15 dated April 27, 2001.}